

CECOS

INTERNATIONAL

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June 17, 1983

Simon

CE83-06/20/83
PRD 980 594 709

Regional Administrator
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

Dear Sirs:

Enclosed is a ground water monitoring plan for CECOS International's waste management facilities located at 500 Municipal Road, Ponce, Puerto Rico. This plan is a compliance item of the Consent Agreement and Consent Order, Work Elements of the Improvement Plan, Section 3, EPA Docket No. II RCRA-82-0301.

Under 40 CFR 265 Subpart F of RCRA regulations, the owners/operators of hazardous waste management facilities are required to implement a ground water monitoring program. The monitoring program developed must be capable of determining the impact of the facility on the quality of ground water contained in the uppermost aquifer underlying the site. The enclosed plan addresses the location and installation of the monitoring wells.

Sincerely yours,

CECOS INTERNATIONAL

Rastadelmaier

ROBERT A. STADELMAIER
Executive Vice President

RAS:klg

Enclosures

ENVIRONMENTAL PROTECTION
AGENCY
NEW YORK, N.Y.

JUN 20 4 10 PM '83

CORRESPONDENCE UNIT
NEW YORK, N.Y.

4.7.2 MONITORING SYSTEM

As discussed in the introduction, the ground water monitoring system for the proposed secure landfill cell is to consist of at least one upgradient and three downgradient wells to be in compliance with 40 CFR 265.91. These wells are intended to detect impacts on the quality of the ground water contained in the uppermost aquifer underlying the site caused by the operation of the hazardous waste management facility.

The ground water monitoring program described in this report has been designed to detect and evaluate adverse impacts on ground water quality which may be caused by the hazardous waste management activities of the Ponce Waste Facility. To accomplish these goals, certain environmental variables will be measured to establish the background quality of ground water and allow the detection of any changes which may occur due to the unintentional release of materials from the waste management areas. By monitoring the levels of these parameters at both upgradient and downgradient wells, as required by the RCRA regulations, several benefits will be obtained.

These benefits include:

- 1) Enabling the differentiation of impacts caused by external activities from those directly related to the presence of the waste management facilities;
- 2) Determining the portion of the aquifer affected by the operations and the extent of this impact;

- 3) Evaluating both synergistic and antagonistic effects;
- 4) Providing a reliable baseline of data, over time, on which to assess the significance of variances in the parameters; and
- 5) Establishing background levels for indicator parameters, thereby allowing the detection of significant changes in the ground water quality.

For the results to be meaningful, the program's sampling must be conducted periodically. The regular, continuous sampling also provides a number of advantages. These benefits include:

- 1) Allowing the regulatory agencies to monitor compliance with environmental standards;
- 2) Providing a record of variations in levels of indicator parameters over time;
- 3) Defining seasonal variations in water quality;
- 4) Generating information which can be useful for planning design and operational improvements; and
- 5) Identifying problems before environmental damage becomes too widespread and/or irreversible.

Hydrogeologic Framework - Because the hydrogeology of the facility site heavily influenced the recommended monitoring well array, a brief summary of the hydrogeology is presented to provide the required background information.

Bedrock hills, consisting of residual soil weathered from the silty limestones of the Ponce formation and the limestones and silts of the Juana Diaz formation, both of mid-Tertiary age, are exposed on the northern and southern portions of the site adjacent to the old drainage features (valleys) now filled with waste and on-site soils.

The Ponce Limestone, which is younger than the Juana Diaz formation, normally overlies the Juana Diaz. Analyses of field data indicate that the Ponce Limestone is in faulted contact with, and now adjacent to, the Juana Diaz at several locations on the site. The on-site fault with the largest displacement is a splayed (split) fault which underlies the waste fill in the old central valley of the site. This fault has a stratigraphic displacement in excess of 200 feet.

Ground water in the Ponce area occurs in three principal aquifers, the Juana Diaz formation, the Ponce Limestone and alluvium in the river basins. Recharge to the ground-water system is derived from rainfall infiltration, return flow of irrigation water and seepage from streams, canals and ponds. Recharge in the Ponce Limestone is rapid where vertical solution channels exist.

The geohydrology of the site is complex. This complexity is due primarily to the effects of faulting on the geohydrologic units. Ground water occurs in the Juana Diaz and Ponce formations at the site at depths of 73 to 260 feet; random pockets of perched water may occur throughout the existing landfill.

In-situ permeability tests performed in the Juana Diaz formation indicated permeabilities between 2×10^{-9} and 9×10^{-9} cm/sec. Although field permeability testing was not performed in the Ponce Limestone, loss of drilling fluid in this formation indicates that interconnected solution channels may impart a high secondary permeability to this formation.

The ground-water flow system at the site is complicated by the presence of the splayed fault traversing the central portion of the site (Figure 4A). There is evidence for three separate flow systems at the site. The splayed fault appears to be recharging the flow system to the south (Juana Diaz); the potentiometric surface for this formation dips to the south, southwest and southeast. Ground-water flow between the two splays of the fault is probably to the southeast along the major axis of the fault block. Although data are insufficient to characterize the ground water flow to the north of the fault, data exists for the area south of the fault so that the flow regime beneath the waste facility is well defined.

Location of Monitoring Wells - Factors to be considered in determining both the number and location of monitoring wells at a waste management facility include; 1) the size, orientation, and boundaries of the facility and the waste management area, and 2) ground-water flow patterns at the site. Section 265.91(a) of 40 CFR requires a minimum of four ground-water monitoring wells with at least one well located hydraulically upgradient and at least

three wells located hydraulically downgradient from the proposed waste management area, which will include a secure landfill cell and adjacent waste treatment facilities.

The proposed waste management area shown on Figure 4A is located in the southern part of the Ponce site in the Juana Diaz formation. Ground water flow gradients in the Juana Diaz formation, which is considered to be the uppermost aquifer, are shown by the potentiometric contours on Figure 4A. The flow pattern derived from the potentiometric contours indicates that ground water is moving beneath the proposed waste management area toward the southeast. The principal fault, which is located near the central part of the site, hydraulically separates the flow regime in the Juana Diaz from the Ponce formation.

Based on the location of the proposed waste management area with respect to the ground-water flow pattern, four monitoring wells are proposed. Well MW-1 (Figure 4A) will be the upgradient well in the Juana Diaz formation and wells MW-2 through MW-4 will be down-gradient from the facility.

To determine if shallow ground-water contamination is occurring within the existing landfill area, monitoring well MW-5 is proposed. In addition other potential wells at other locations within the existing landfill are being considered. If significant contamination is not encountered in MW-5 then the other potential wells may not be necessary. The exact locations and depths of such potential wells will be determined on the basis of on-going site studies and subsurface exploration. The purpose of well MW-5 and other potential wells will be to obtain

samples of water in more permeable zones of alluvium below the base of the existing sanitary landfill. Such shallow ground water may not occur during all seasons of the year and is not expected to be continuously present.

Thus this shallow ground water is at this time considered to be separate from the uppermost aquifer. It is therefore possible that some or all of these wells may yield only limited volumes of water, if any.

Depending on the results of this sampling and analyses of shallow ground water within the existing sanitary landfill, additional deeper wells may also be required.

Drilling Methods - The diameter of the borehole used for construction of downgradient monitoring wells MW-2, MW-3, and MW-4 will be 5.5 inches. The boreholes will be drilled with a 5.5-inch diameter tri-cone bit using compressed air as a drilling fluid (Figure 4B). The air compressor will be fitted with an oil/water filter on the discharge line in order to prevent these fluids from entering the hole. Split-spoon samples will be taken at selected depths to provide lithologic information at the well locations.

The upgradient well, MW-1, will be drilled with a 6-inch diameter auger through the waste-fill/alluvial material (Figure 4C). After a surface casing is installed, the annulus will be grouted to prevent vertical contamination of the well. The next day, the remainder of the hole will be drilled with a tri-cone bit using air as a drilling fluid. The planned depth and diameter of each well is described in Table 4A.

To prevent/minimize cross-contamination of monitoring wells, specific cleaning procedures will be utilized on all equipment that will enter the borehole during the drilling operations and well installation. Before installing the first well, the drilling equipment will be steam-cleaned to remove oil and grease from the drilling tools. Before moving onto a monitoring well site, potable water, phosphate-free detergent and cleaning brushes will be used to thoroughly clean the equipment. After detergent cleansing, the equipment will be rinsed with potable water. If a piece of equipment appears to become contaminated during the drilling operations, it will be recleaned prior to its next use.

Casing - The casing which will be used consists of 2-inch I.D., schedule 40 PVC pipe with flush threaded joints. The screen will consist of 30 feet of machine-slotted PVC threaded pipe with a slot size of .010 inches. Casing centralizers will be attached to the casing to provide uniform sand pack and grout seal. The precise depth interval of the well screen for each well will be determined by the field conditions.

Filter Packing - A sand pack will be placed in the annular space around the well screen until there is at least 2 feet of sand above the top of screen. The height of the sand pack in the hole will be measured periodically with a weighted steel tape.

After the sand pack has been placed in the hole, a 1-foot thick layer of bentonite pellets will be placed on top of the sand pack to prevent any grout slurry from clogging the screened zone.

Sealing of Wells - A cement/bentonite grout slurry will be pumped in the annular space from above the bentonite seal to land surface. The purpose of the grout is to seal the well casing which will prevent cross-contamination between surface materials and ground water at the screened zone.

The grout slurry will be placed in the hole by pumping through a tremie pipe which will be inserted in the annular space alongside the PVC casing.

Well Development - Well development is necessary to restore the natural hydraulic conductivity of the formation and remove fine-grained particles (clay and silt), which can easily interfere with chemical analysis.

The wells will be developed by air surging using an air compressor. The compressor will be equipped with a filter to prevent introducing oil or water into the well. The well will be developed for about 2 hours or until the water becomes clear and the pH and conductivity is stabilized. The pH and specific conductance will be monitored throughout the well development.

Aquifer Testing - Each monitoring well will be tested to determine the hydraulic conductivity (K) of the uppermost aquifer. The average K for the uppermost aquifer, along with measured water levels, will be used to calculate the ground water flow rate each time the well is sampled for chemical analysis.

Aquifer tests will consist of "slug" tests where the water level is instantaneously raised with a weighted float. The declining water level is then measured with an electric tape or pressure transducer. Once the water level becomes static, the float is removed and the recovering water level is measured. A data plot of changing head (H) divided by initial head (H_0) plotted against time (t) in seconds yields a data curve from which hydraulic conductivity (in cm/sec) can be calculated.

TABLE 4A - PROPOSED MONITORING WELL CONSTRUCTION DETAILS

<u>WELL NO.</u>	<u>LOCATION</u>	<u>FORMATION SCREENED</u>	<u>DEPTH OF HOLE (FT)</u>	<u>SCREENED INTERVAL (FT)</u>	<u>DIAMETER OF WELL (IN)</u>	<u>SPECIAL REQUIREMENTS</u>
MW-1	Upgradient	Juana Diaz	220	180-210	2.0	6-inch flush threaded steel surface casing. Protective steel casing adaptable for additions as needed to remain above grade. Centralizers near screen.
MW-2	Downgradient	Juana Diaz	230	190-220	2.0	Centralizers near screen section.
MW-3	Downgradient	Juana Diaz	170	130-160	2.0	Centralizers near screen section.
MW-4	Downgradient	Juana Diaz	120	80-110	2.0	Centralizers near screen.
MW-5	Downgradient	Waste-fill/ Alluvium	40	30- 40	2.0	Centralizers near screen.
Potential Wells		Waste-fill/ Alluvium and Possibly Underlying Units	?	?	2.0	Centralizers near screen.



LOCATION MAP

EXISTING WASTE LAGOONS

18°00'38"

PROPERTY BOUNDARY

APPROXIMATE TOE OF CUT SLOPE

MW-1

TANKS

TREATMENT FACILITIES

CELL NO. 1

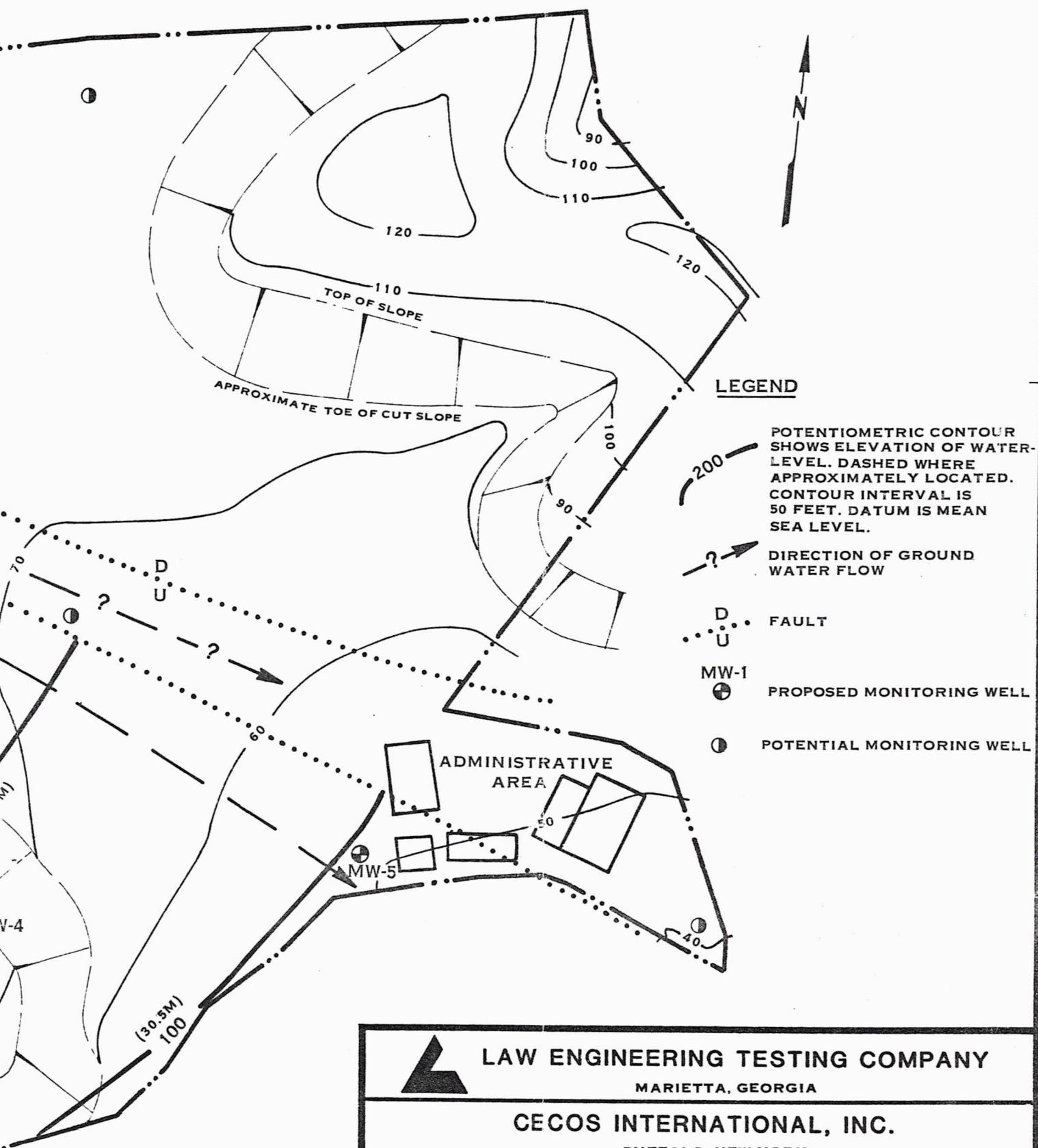
MW-2

MW-3

BASE MAP MODIFIED BY
COMPONENTES, 1:1000
CONTOUR INTERVAL 10

66°39'45"





PLANO TOPOGRAFICO DE FINCAS
 LE, BY MENSURAS PROFESIONALES, 1980
 METERS: DATUM IS MEAN SEA LEVEL


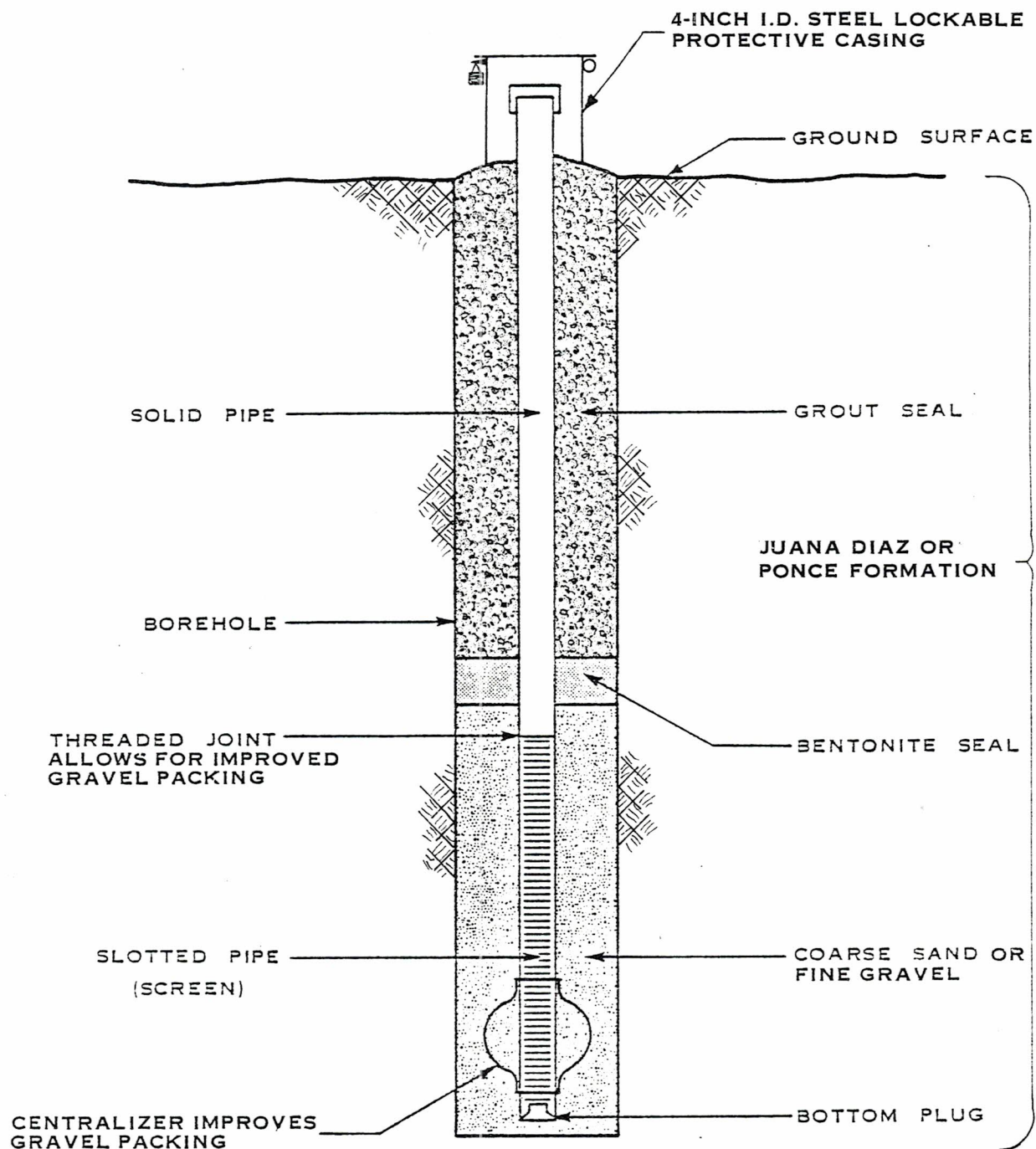
 LAW ENGINEERING TESTING COMPANY MARIETTA, GEORGIA			
CECOS INTERNATIONAL, INC. BUFFALO, NEW YORK			
	BY	DATE	PONCE WASTE FACILITY MONITORING WELL LOCATION PLAN JOB NO. GS3223
DRAWN	R.P.A.	6/15/83	
CHECKED	D.G.M.	6/15/83	
APPROVED	J.D.G.	6/15/83	

FIGURE 4A



(NOT TO SCALE)

NOTE: THIS WELL DIAGRAM PERTAINS TO WELL LOCATIONS WHERE IN-SITU GEOLOGIC FORMATIONS EXIST AT GROUND SURFACE



LAW ENGINEERING TESTING COMPANY

MARIETTA, GEORGIA

CECOS INTERNATIONAL, INC.

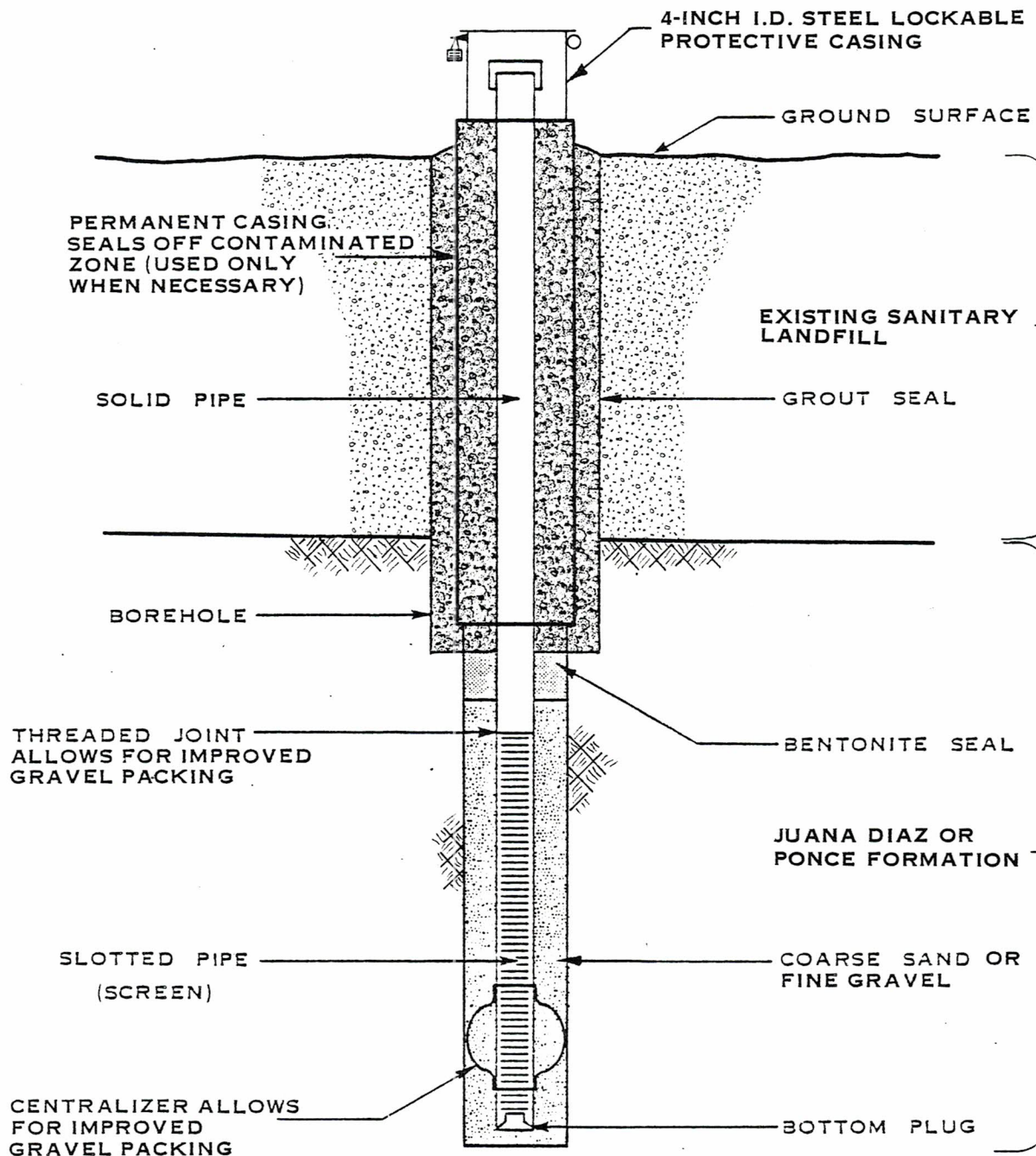
BUFFALO, NEW YORK

	BY	DATE
DRAWN	R.A.	6/15/83
CHECKED	DGM	6/15/83
APPROVED	J.D.G.	6/15/83

PONCE WASTE FACILITY
MONITORING WELL
CONSTRUCTION DIAGRAM
FOR NON-WASTE-FILL WELLS


JOB NO. GS3223

FIGURE 4 B



(NOT TO SCALE)

NOTE: THIS WELL DIAGRAM PERTAINS TO WELL LOCATIONS WHERE EXISTING SANITARY LANDFILL MATERIAL EXISTS AT GROUND SURFACE

 LAW ENGINEERING TESTING COMPANY MARIETTA, GEORGIA		
CECOS INTERNATIONAL, INC. BUFFALO, NEW YORK		
BY	DATE	PONCE WASTE FACILITY MONITORING WELL CONSTRUCTION DIAGRAM FOR WELLS PENETRATING EXISTING LANDFILL JOB NO. GS3223
DRAWN	RA. 6/15/83	
CHECKED	DMH 6/15/83	
APPROVED	J.D.G. 6/15/83	
		FIGURE 4C

